SIEMENS

Industrial machinery and heavy equipment

Picanol

Manufacturer uses LMS Imagine.Lab Amesim to develop the "most energy-efficient weaving looms on the market"

Product

LMS

Business challenges

Conduct early-stage simulation to release innovative products faster

Produce machines that have a low cost of lifetime ownership

Manufacture energy-efficient machines without sacrificing performance

Keys to success

Support the scalable optimization of energy flows

Take into account energy efficiency and total cost of ownership as key performance criteria

Optimize machine design from the onset

Results

Designed the "most energy-efficient weaving looms on the market"

Achieved early-stage product optimization

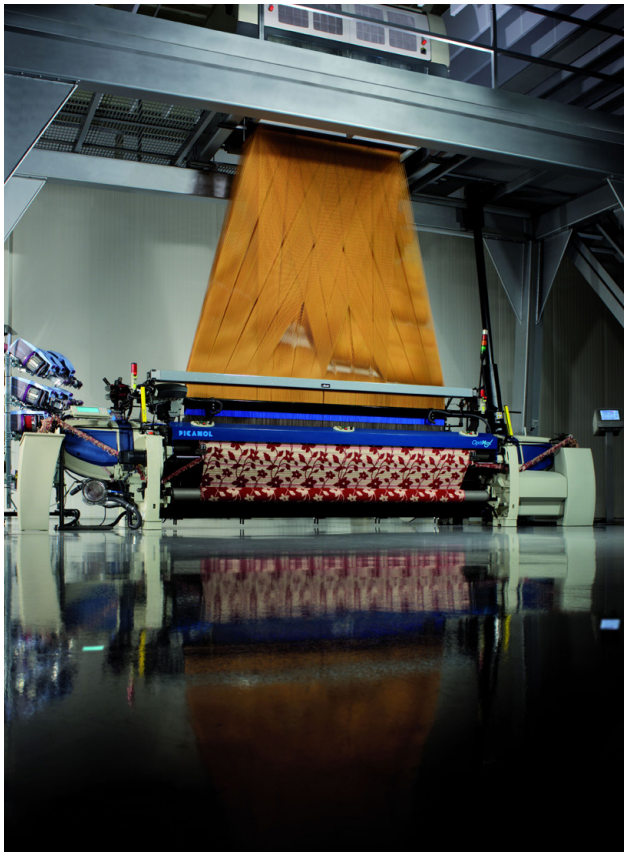
Siemens PLM Software solutions enable Picanol to achieve early-stage product optimization

Pioneering weaving machines

Speed matters in the production machinery industry. Whether you are producing recycled paper or high-tech fabric, top production speed is required at all times, but not at all costs. In the 21st century, manufacturers have had to deal with new environmental issues as well as one of the most severe economic crises in modern history. Whatever you are manufacturing, conserving energy is essential.

The ESTOMAD (Energy Software Tools for Sustainable Machine Design) consortium was established in 2009 with industry players and research institutes such as LMS International (now Siemens PLM Software), Flanders' Mechatronics Technology Centre, JOBS, EC Engineering, the Institute of Industrial Technologies and Automation, FIDIA and the Catholic University of Leuven (Belgium). The European research project aims to create a machine development process that considers energy efficiency a critical parameter in machine design.

Picanol is one of the industrial actors involved in the ESTOMAD project. Picanol develops and manufactures high-tech weaving machines that are based on air jet and rapier technology. For 75 years, Picanol has played a pioneering role in the weaving machine industry to become a leading global player. Besides its headquarters in Ypres, Belgium, the Picanol Group has facilities in Asia, Europe and the United States. Today, about 2,600 weaving mills around the world use Picanol machinery, totaling some 130,000 weaving machines.



Results *(continued)*

Balanced performance, durability, noise and vibration parameters while minimizing energy consumption

Implemented advanced model-based system engineering

"Due to rising energy prices, low energy consumption is essential to managing operational expenses. Our products must deliver the highest fabric quality at the lowest total cost of ownership for the weaver. We have focused our efforts on energy efficiency to gain a substantial competitive advantage."

Kristof Roelstraete
Manager
Research and Development
Picanol

Seeking energy efficiency

Stringent market regulations and a tough competitive environment are compelling the production machinery industry to improve its machine design processes. Manufacturers need to deliver top-performing machines that comply with strict health and safety requirements. Innovations are being introduced faster all the time. These considerations make early-stage simulation virtually compulsory to release innovative products faster and faster. The industry is also experiencing a recent shift in customer expectations.

"It's not all about purchase price or performance anymore," says Kristof Roelstraete, the research and development (R&D) manager at Picanol. "More and more customers tend to choose the machine that offers the best deal in terms of total cost of ownership. They don't only consider the initial investment price, but also maintenance and operational costs for the complete machine lifecycle.

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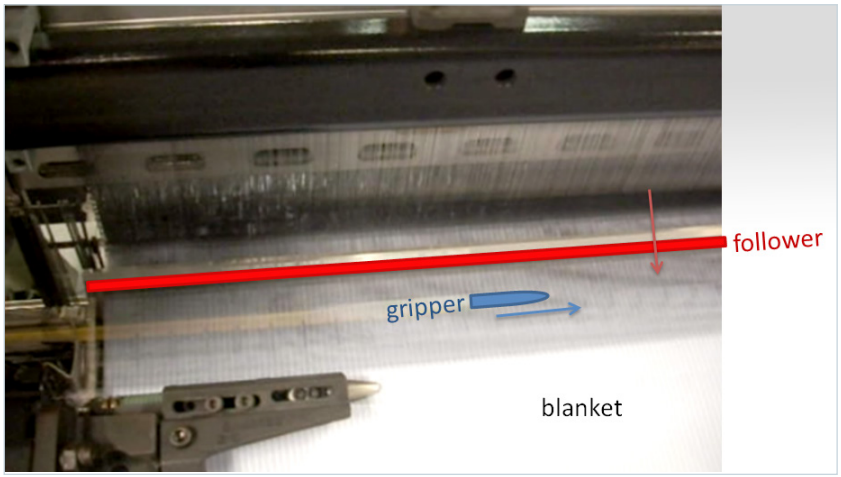
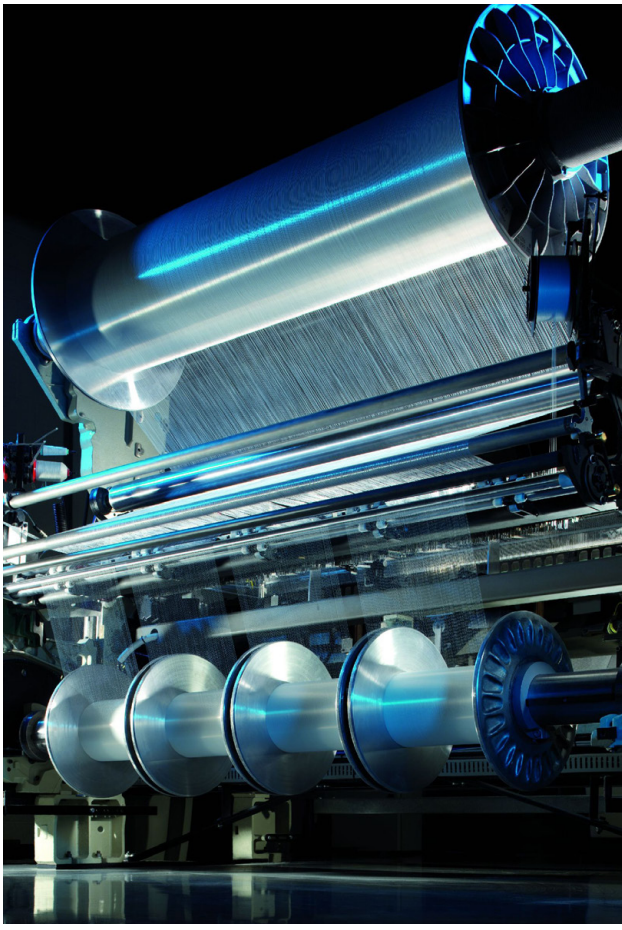
Supporting scalable optimization

Within the framework of the ESTOMAD project, Picanol improves the energy efficiency of its weaving machines without



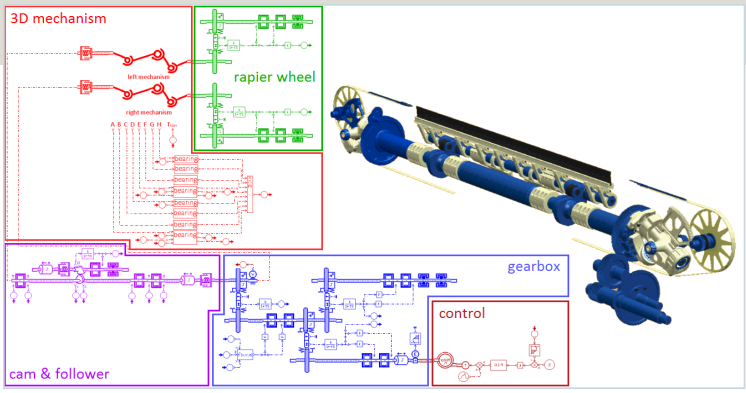
Gripper and follower motion.



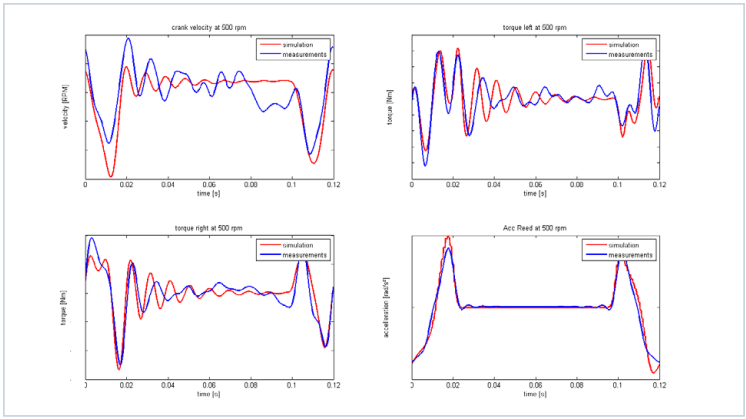
Picanol gripper weaving machine (Optimax).

sacrificing performance. In close collaboration with the Catholic University, Picanol R&D engineers started with building the model of the energy flows inside the main driveline of a weaving machine. Creating this model is a complex task: it should accurately predict all inner energy transfers as well as expose local energy leaks. It needs to provide a detailed representation of energy behavior for each component while integrating with the global machine's multiphysics environment. The ESTOMAD consortium has selected LMS Imagine.Lab Amesim™ software from Siemens PLM Software as the mechatronic system simulation platform to perform energy management studies on industrial machines. LMS Amesim lets engineers consistently analyze all energy flows in the various subsystems of a weaving machine, from the insertion system to the motor over the gearbox and main shaft.

To support the scalable optimization of energy flows, the graphical user interface (GUI) of LMS Amesim and the machinery



LMS Imagine.Lab Amesim model of the weaving machine in co-simulation with LMS Virtual.Lab Motion.



The correlation between on-site system measurements and the LMS Imagine.Lab Amesim/LMS Virtual.Lab co-simulation model at 500 RPM.

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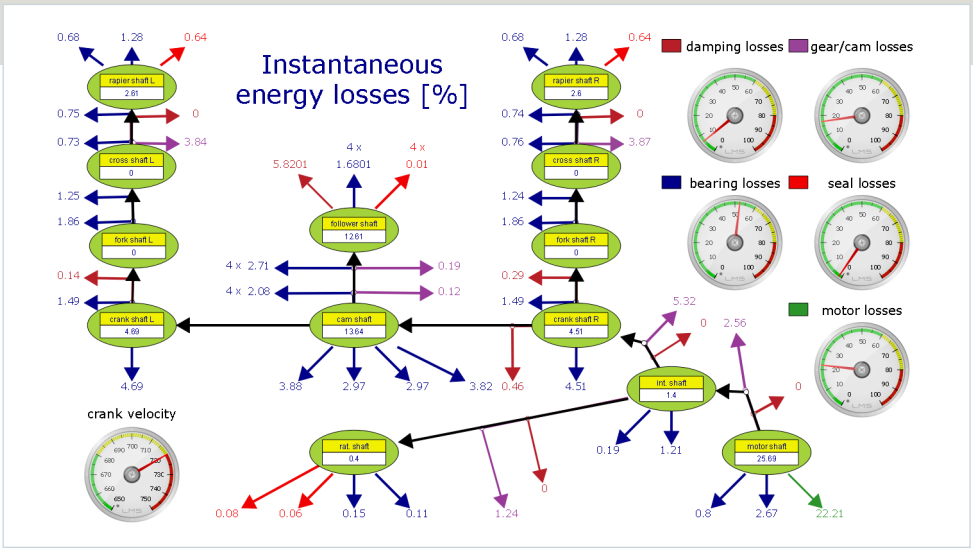

Flow chart of the instantaneous energy losses with respect to the dissipating components.

components libraries have been specially updated to help engineers design environmentally friendly machines. Picanol engineers optimize machine design from the earliest stage, taking energy-efficiency as a critical performance requirement.

One step further in the development process, LMS Amesim is coupled with LMS Virtual.Lab™ software from Siemens PLM Software in a co-simulation arrangement. Consequently, even the complex 3D mechanisms of the weaving machine (which require a detailed dynamic and kinematic modeling) are simulated and optimized, leveraging the new functionalities of LMS Amesim to deliver a more ecological design.

The LMS Amesim submodel editing tool, the platform's customization tool, can be used to natively integrate all the required power and energy variables, meaning that specific components can be created easily and quickly and assessed with regard to energy consumption objectives. In the framework of the ESTOMAD study and with the particular involvement of the Catholic University of Leuven, Picanol engineers could seamlessly interface LMS Amesim with the MATLAB® environment to perform parameter identification. The Picanol-ESTOMAD project reveals a precise correlation between LMS models and measurements performed on weaving machines, a major study outcome that will help improve future machine development processes.

Leveraging model-based system engineering

The extensive Siemens PLM Software portfolio supports Picanol in the early-stage optimization of weaving machines, balancing all critical performance, durability, noise and vibration parameters while minimizing energy consumption.

"We highly appreciate the products and support from Siemens PLM Software," says Roelstraete. "They help us design the most energy-efficient weaving looms on the market. A platform like LMS Amesim offers extensive libraries of components that also connect to describe complete multiphysics systems, a prerequisite for advanced model-based system engineering.

Solutions/Services

LMS Imagine.Lab Amesim
www.siemens.com/plm/lms-amesim

LMS Virtual.Lab
www.siemens.com/plm/lms-virtual-lab

Customer's primary business

Picanol develops, produces and markets high-tech weaving machines. Picanol weaving machines are a synthesis of technological know-how and experience built up over more than half a century. Today, about 2,600 weaving mills around the world use Picanol machinery, totaling approximately 110,000 weaving machines.
www.picanol.be

Customer location

Ypres
Belgium

Achieving this with scripting programs such as MATLAB or Python is unrealistic."

More projects focused on energy saving and energy management will probably be started in the near future, not only because of the expected profit, but also in response to upcoming environmental challenges. Picanol is well-positioned to take the lead by designing the most ecological weaving machines on the market. Roelstraete also predicts that model-based system engineering will become a standard design procedure in the production machinery industry in the coming years.

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